

8.0 Survey Management Use Cases

8.1 Overview of Survey Management Use Cases

The use cases for survey management (SM) are intended to describe the various business processes necessary to conduct field surveys in an automated GIS environment. An important aspect of any survey project is to research all available records for pertinent data. The first use case, **SM-01 Survey Research**, is designed to assist in locating and evaluating survey and survey related records. The **SM-02 Pre-Field Survey Setup** use case guides a user through the necessary steps to prepare a data collection device (i.e. laptop or palmtop) for use in the field. This may include the transfer of reference data to the data collection device immediately or at a future time. The **SM-02 Pre-Field Setup** may occur on a data collection device or on a desktop personal computer for later transferal to the data collection device. The **SM-03 In-Field Survey Setup** use case assists a user in configuring or modifying a *field survey setup file* for a data collection device. The field survey setup file is an output from **SM-02 Pre-Field Survey Setup**. The **SM-04 Collect Field Data Observations** use case provides for the polling (reading) of observations from *measuring devices* such as a total stations, the storage of the observations, and reduction of the observations (i.e., mean of the observation sets, slope distance to horizontal, difference in elevations, etc.). **SM-05 Perform COGO and Layout** provides coordinate geometry functions.

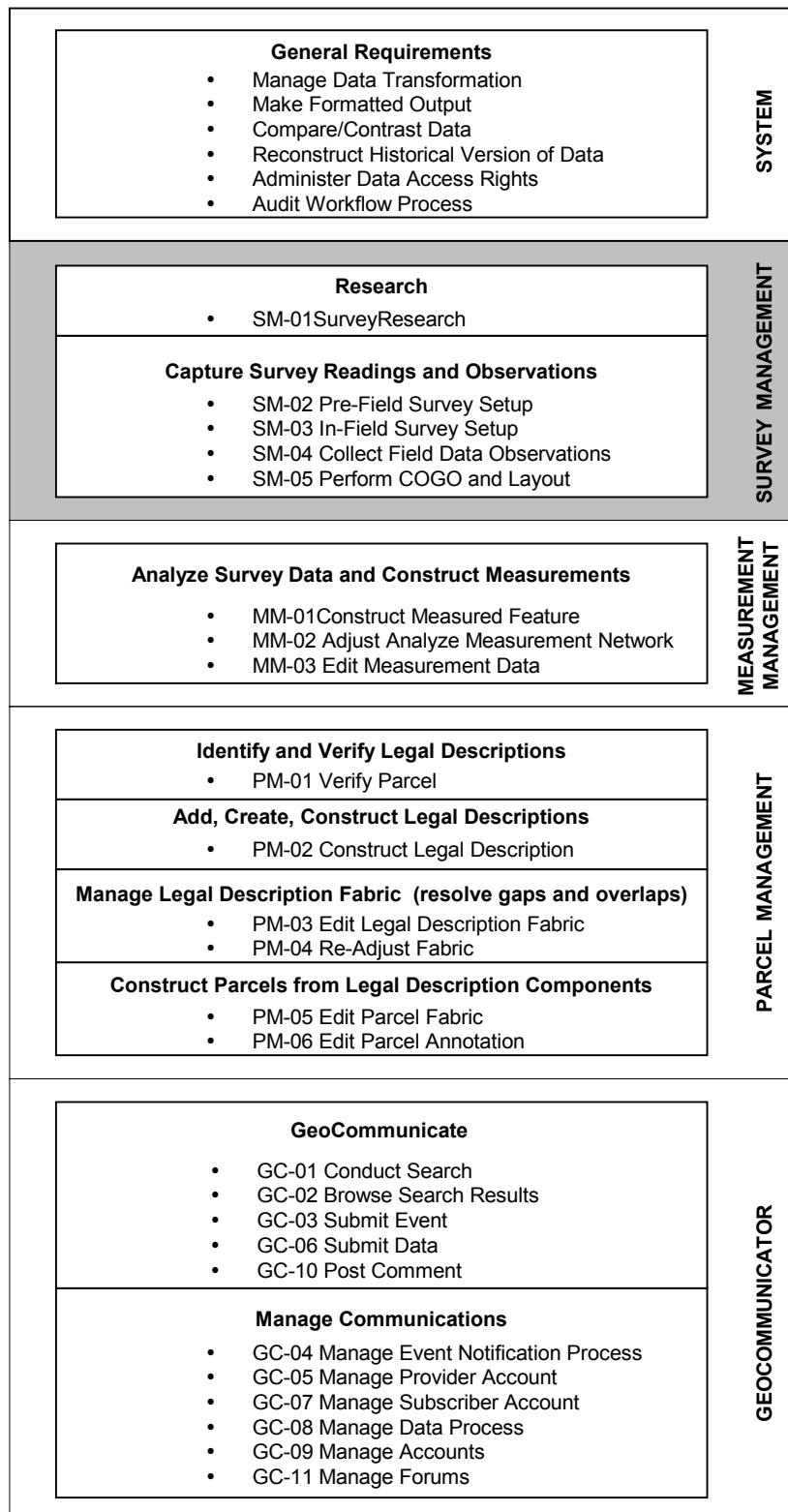
Note: *There are certain key survey and mapping terms that must be understood in order to interpret the survey management use cases. These terms have special meaning in the context of the use cases. They are defined in complete list can be found in Appendix A- Glossary of Use Case Terms.*

8.2 Survey Management Use Case Analysis

The remainder of this section presents the individual survey management use cases. Survey management use cases are used to build the measurement foundation of the NILS 'Field-to-Fabric' concept. Table 8.1 summarizes the survey management use cases. Figure 8.1 shows the relationship of these use cases to the other NILS use cases.

Table 8.1. Survey Management Use Cases

Use Case	Section	Description
SM-01 Survey Research	8.3	Locate, view and evaluate all relevant digital database and non-digital records for the <i>research scope</i> . Sources may include hardcopy records, plats, monument rubbings, aerial photos, survey notes, etc.
SM-02 Pre-Field Survey Setup	8.4	Process to create a <i>field survey setup file</i> to manage the collection of <i>readings</i> , <i>observations</i> , and <i>measurements</i> .
SM-03 In-Field Survey Setup	8.5	This is the in-field process to configure a <i>data collection device</i> and/or a <i>computation device</i> by selecting and applying a <i>field survey setup file</i> . (An example <i>data collection device</i> is a palmtop configured with NILS field survey software. An example <i>computation device</i> is a laptop configured with NILS field survey software. Data collection devices and/or computation devices are distinguished from a measuring device such as a total station.)
SM-04 Collect Field Data Observations	8.6	Actor performs field data collection by recording <i>readings</i> using a <i>data collection device</i> . Readings are <i>computed</i> with a <i>computation device</i> to derive <i>observations</i> and <i>measurements</i> .
SM-05 Perform COGO and Layout	8.7	Process to use coordinate geometry (COGO) tools to calculate coordinate positions. Includes planar and geodetic calculations. May be used to perform layout or to search for <i>point</i> locations. May be used in conjunction with building a <i>measurement network</i> , a <i>legal description fabric</i> , or a <i>parcel fabric</i> .

Figure 8.1. Business Process Analysis-Survey Management Use Cases

8.3 SM-01 Survey Research

8.3.1 SM-01 Survey Research Analysis

Context	Surveyors have indicated that they spend significant amounts of time performing research in preparation for any survey. The surveyor must search through various records repositories to find the legal descriptions, ordinances, and other jurisdictional documents that affect the land status of the survey area. To the extent that records and data are available in digital form, the surveyor can capture relevant reference materials and save them for use in the field.
New Concepts	<p>Survey. Typically, a boundary survey performed in the field by a professional land surveyor, but not meant to exclude a variety of field survey types (e.g., <i>boundary survey</i>, <i>site survey</i>, <i>resource mapping</i>, <i>right-of-way survey</i>, <i>transect survey</i>, <i>administrative survey</i>, <i>densification of control corners</i>, <i>topological survey</i>, <i>engineering/construction survey</i>, <i>real-time mapping (GPS)</i>, <i>ALTA</i>, <i>custom</i>, <i>vertical control survey</i>).</p> <p>Survey Project. This is an organizational/system concept to represent a set of field activities. It's where and how all the relevant data and files are stored for future use. A <i>survey project</i> may be comprised of one or more <i>field surveys</i>.</p> <p>Research Scope. Data to be investigated for a given project defined by spatial extent and source criteria. May include digital records and hardcopy records during a defined epoch. The total of the selected search parameters or the query including spatial extent.</p>
Key Features and Functionality	The actor has the ability to define and redefine search parameters. Reference sources include all available paths (local data, WAN/LAN data, internet data). The actor can browse available data and information (may have to download data files first) and save those that are within the <i>research scope</i> . The idea of specifying, saving and re-using research templates is a potentially useful feature.
Application Integration	SM-01 Survey Research is very closely related to the GeoCommunicator GC-01 Conduct Search and GC-02 Browse Research Results use cases. GeoCommunicator provides access to many categories of data and events. A surveyor may want to publish notice of the survey research or planned survey event to attract cooperators or information that would improve the field effort. A surveyor may wish to look for 'data discrepancies'-areas where the survey world just doesn't come together well.

These types of research are not possible unless indexes and catalogs of related information and data are accessible-the survey reference library must be maintained.

**Development
Implications**

This is the first use case in the ‘Field-to-Fabric’ cadastral maintenance process.

8.3.2 SM-01 Survey Research Overview

Use Case	SM-01 Survey Research
Description	Locate, view and evaluate all relevant digital database and non-digital records for the <i>research scope</i> . Sources may include hardcopy records, plats, monument rubbings, aerial photos, survey notes, etc.
Actors	Surveyor, Survey Supervisor
Pre-Condition	Actor needs to research available, relevant records to support a <i>survey project</i> .
Post-Condition	Available digital and non-digital records have been identified and listed for use in SM-02 Pre-Field Survey Setup .
Cross-Reference	SM-02 Pre-Field Survey Setup ; System Audit Process; GC-01 Conduct Search

8.3.3 SM-01 Survey Research Primary Scenario

Actor Action	System Response
1. This use case begins when an actor launches the SM-01 Survey Research process.	2. Display research definition tools (e.g. define spatial extent, source types, date ranges)
3. Actor defines an initial <i>research scope</i> and record types (i.e. query parameters).	4. Search and locate records (GeoCommunicator, internet locations, databases, etc.)
	5. Display research scope and list references to available records. Indicate record location and type.
6. Actor browses list; may view available records of interest.	7. Display record in appropriate format. [view another record] Return to #6.
8. Actor selects records and requests hard copy or soft copy.	9. Process selection. [soft copy] Save selected records to actor-specified destination. [hardcopy] Print selected records.

Actor Action	System Response
10. Actor may refine list. Actor may choose to save and/or print project <i>research scope</i> and/or record list. Actor may choose to relate record list to a <i>Survey Project</i> .	11. <i>Research scope</i> and record list is saved/printed for use in SM-02 Pre-Field Survey Setup . Link record list, records and <i>research scope</i> to <i>Survey Project</i> . [new <i>Survey Project</i>] create project

8.3.4 SM-01 Survey Research Secondary Scenarios

Name	Point of Occurrence/Overview
Automatically archive initial record list as part of System Audit Process setup.	Step 5: Create link to <i>survey project</i> and save record list index.
Actor wants to save initial record list.	Step 5: Go to #10.
Actor wants to expand or limit <i>research scope</i> .	Step 5: Return to Step 3.

8.4 SM-02 Pre-Field Survey Setup

8.4.1 SM-02 Pre-Field Survey Setup Analysis

Context	Once survey research is completed, the surveyor must prepare instruments and equipment. It is often the case that a particular <i>survey project</i> is divided into multiple <i>field surveys</i> , each of which has a specific set of associated <i>data</i> , files and set up parameters. The goal of this use case is that a survey party or parties could select from a set of <i>field surveys</i> and apply the setup file information to configure the instruments. This may include establishing data sets, device drivers, communication protocols, and so on.
Concepts	<p><i>Computation device.</i> The computing hardware system and processing software for deriving <i>observations</i> and <i>measurements</i> from <i>readings</i>. May be used with a <i>data collection device</i> on the same computing hardware system.</p> <p><i>Data collection device.</i> An instrument for digital storage of <i>readings</i> and information about those readings. Information may be input manually or digitally.</p> <p><i>Field survey.</i> A category of <i>surveys</i>. <i>Measurement of features</i> for locating the position, or layout, of physical objects or theoretical position. For example, a property corner is theoretical, but a property corner monument is a physical object.</p> <p><i>Field survey data set.</i> The organizational/storage container for data, files and information pertaining to a particular <i>field survey</i>.</p> <p><i>Field survey setup file.</i> A list of parameters and configurations for the setup of a <i>data collection device</i>.</p> <p><i>Field survey setup file template.</i> A form to assist an actor in creating or editing a list of parameters and configurations for the setup of a <i>data collection device</i>. (Field survey setup file templates are used to guide the generation of a <i>field survey setup file</i>, which defines the type of data to collect; geodetic vs. planar geometry; the hardware, communications parameters; the spatial extent; setup instructions for custom in-field menus and data collection forms; paths to reference coverages, images, and documents; and the link from the <i>field survey</i> to its <i>survey project</i>.)</p> <p><i>Measurement.</i> A value that is constructed as a result of computations performed using <i>observations</i>.</p> <p><i>Observation.</i> Single set of <i>measurement</i> values for a <i>feature</i>. The values may include vertical or zenith angle, horizontal angle, slope</p>

distance, backsight and foresight heights, and so on. The act of obtaining a distinct piece of information that helps describe the dimensions or spatial relationships between points on physical features.

Readings. A value taken from an arbitrary scale (chronometer, theodolite circle, compass, chain, etc.) returned by a *measuring device*. (See *observation*.)

Survey project. This is an organizational/system concept to represent a set of field activities. It's where and how all the relevant data and files are stored for future use. A survey project may be comprised of one or more *field surveys*.

**Key Features
and
Functionality**

This process is where the actor prepares the necessary files to properly configure the instruments and data to be used in a particular field survey. The actor has the option to import information saved during the research process. Templates are associated with standard field survey types. An example of template information would be a pre-defined data collection form that is associated to a stored database (identifies the attribute fields to be populated, to be viewed as read-only, etc.) The actor may select a template, may then input to or modify the template, or may generate a custom setup and save it as a template. The actor can select from a set of measuring devices, data collection devices and computation devices to be used together during the field survey. Based on the options chosen by the actor, the appropriate hardware and software configuration information is saved for use in the field.

**Application
Integration**

This set of operations is typically preceded by ***SM-01 Survey Research*** and followed by ***SM-03 In-Field Survey Setup***.

**Development
Implications**

This set of tools has significant dependency and limitations related to the possible set of hardware and software that may be used in combination for field survey. GIS-type functionality requires display and processing capability as available from the generic class of system referred to a *computation device*. A *data collection device* may have a scaled-down operating system and display (e.g., a palmtop unit) or may be a totally closed, custom hardware system integrated with the surveying hardware. To enable the full power of GIS (and measurement management) in the field may require a computation device.

8.4.2 SM-02 Pre-Field Survey Setup Overview

Use Case	SM-02 Pre-Field Survey Setup
Description	Process to create a <i>field survey setup file</i> to manage the collection of <i>readings, observations, and measurements</i> .
Actors	Surveyor, Supervisor
Pre-Condition	Actor needs to compile information, generate a <i>field survey setup file</i> and configure a <i>data collection device</i> and/or a <i>computation device</i> in preparation for a <i>field survey</i> . The host computer must be connected to the main database.
Post-Condition	A <i>field survey setup file</i> is created and uploaded to the <i>data collection device</i> and/or a <i>computation device</i> . Available supporting data is copied to a local <i>field survey data set</i> , and GeoCommunicator notice is sent if that option was chosen.
Cross-Reference	SM-01 Survey Research; SM-03 In-Field Survey Setup; GC-10 Post Comment

8.4.3 SM-02 Pre-Field Survey Setup Primary Scenario

Actor Action	System Response
1. This use case begins when the actor launches the SM-02 Pre-Field Survey Setup process	2. Display choice of <i>field survey</i> types. Example <i>field survey</i> types include: Boundary survey Site Survey Resource Mapping Right-of-way survey Transect survey Administrative survey Densification of control corners Topological survey Engineering/Construction survey Real-time mapping (GPS) ALTA Custom Vertical Control survey
3. Select survey type.	4. Retrieve and display <i>field survey setup file template</i> , based on selection. [survey type is "custom"] Assist in constructing and optional saving of a custom template.

Actor Action	System Response
5. Input to <i>field survey setup file template</i> as appropriate. May set GeoCommunicator toggles. May create <i>survey project</i> and establish links to it from <i>field survey</i> . May import information saved during the SM-01 Survey Research process.	6. System imports data and creates <i>field survey setup file</i> based on responses to prompts (in #2 and #4). Provide option to configure <i>data collection device</i> and/or a <i>computation device</i> . [import information] Import Survey Project parameters as saved in SM-01 Survey Research . [required template fields not filled in] Advise actor and return to #5. [GeoCommunicator notification is toggled ON] Transmit information about planned/proposed <i>field survey</i> to GeoCommunicator. [establish link to <i>Survey Project</i>] Create a link between the <i>survey project</i> and the <i>field survey</i> . [new <i>Survey Project</i>] Create project.
7. May configure a separate in-field hardware system.	8. Upload <i>field survey setup file</i> to <i>data collection device</i> and/or a <i>computation device</i> . Upload reference data specified in the <i>field survey setup file</i> .

8.4.4 SM-02 Pre-Field Survey Setup Secondary Scenarios

Name	Point of Occurrence/Overview
Missing data; actor lacks permission	Step #4. System notifies actor.
Hardware configuration error; System out of storage space.	Step #8. System notifies actor.

8.5 SM-03 In-Field Survey Setup

8.5.1 SM-03 In-Field Survey Setup Analysis

Context	This is the in-field version of setting up to perform a field survey.
Concepts	Same as <i>SM-02 Pre-Field Survey Setup</i>
Key Features and Functionality	The main difference between this set of operations and the pre-field operations is that the actor must be able to modify setup files while in the field. A survey crew may be performing several <i>field surveys</i> , and requires the ability to select a new setup, to modify it if needed, and to launch the new field data observation collection processes with the appropriate data, menus and forms.
Application Integration	<p>This is the first step by the surveyor while in the field. Hardware, software, data and associated information are configured. The system is ready for station orientation and collection of readings, observations and measurements.</p> <p>Once in the field, the data collection device is typically not connected to the LAN/WAN: if any information is missing, either the field survey must be performed in a modified format, or it must be postponed until all necessary data and configuration information is obtained.</p>

8.5.2 SM-03 In-Field Survey Setup Overview

Use Case	SM-03 In-Field Survey Setup
Description	<p>This is the in-field process to configure a <i>data collection device</i> and/or a <i>computation device</i> by selecting and applying a <i>field survey setup file</i>.</p> <p>(An example <i>data collection device</i> is a palmtop configured with NLS field survey software. An example <i>computation device</i> is a laptop configured with NLS field survey software. Data collection devices and/or computation devices are distinguished from measuring devices such as a total station.)</p>
Actors	Surveyor, Supervisor
Pre-Condition	Actor is in the field and needs to initiate a <i>field survey</i> . The <i>data collection device</i> and/or <i>computation device</i> must be configured by applying a <i>field survey setup file</i> . Actor may need to modify field survey setup file parameters.

Use Case	SM-03 In-Field Survey Setup
Post-Condition	<i>Data collection device and/or computation device is ready to begin collecting readings, observations, and measurements for the field survey.</i>
Cross-Reference	SM-02 Pre-Field Survey Setup; SM-04 Collect Field Data Observations

8.5.3 SM-03 In-Field Survey Setup Primary Scenario

Actor Action	System Response
1. This Use Case begins when the actor launches the SM-03 In-Field Survey Setup procedure.	2. Display the list of available <i>field survey setup files</i> to be used. [survey type is "custom,"] System should prompt actor to construct/save a custom <i>field survey setup file</i> (use SM-02 Pre-Field Survey Setup use case).
3. Select a <i>field survey setup file</i> .	4. Display <i>field survey setup file</i> in an edit form. Note: depending on the <i>data collection device</i> and/or <i>computation device</i> configuration, the <i>field survey setup file</i> edit form may disable some choices (some choices grayed out).
5. Modify the <i>field survey setup file</i> as appropriate (and if needed) and save. Apply field survey setup file to <i>data collection device</i> and/or a <i>computation device</i> .	6. Configure <i>data collection device</i> and/or a <i>computation device</i> based on final <i>field survey setup file</i> . Launch field data observation collection processes with appropriate data, menus and forms. [Required <i>field survey setup file</i> fields not filled in] Advise actor and return to #5.

8.5.4 SM-03 In-Field Survey Setup Secondary Scenarios

Name	Point of Occurrence/Overview
Actor lack of permission	Step #4. System notifies actor.
Hardware configuration error; configuration errors, i.e. Data requested by <i>field survey setup file</i> is unavailable.	Step #6. System notifies actor.

8.6 SM-04 Collect Field Data Observations

8.6.1 SM-04 Collect Field Data Observations Analysis

Context	<p>This set of operations is the actual work of performing the <i>field survey</i>. Initial orientation is completed and instruments are set up and calibrated. The surveyor is ready to sight to a feature, capture readings, and process readings to derive measurements. The surveyor may sight to and traverse from point to point as needed to derive the geometry and/or attributes of the subject features. In a <i>boundary survey</i>, the subject features are typically corners, boundary lines, and areas.</p> <p>Once the component readings are collected, they may be processed by a variety of computation methods to derive observations and measurements.</p>
New Concepts	<p><i>Computation.</i> A set of processing methods or algorithms applied to achieve a desired solution. COGO procedures use computations.</p> <p><i>Observation collection form.</i> A list of configuration options to assist the actor in the setup for the collection of a particular type of observation.</p> <p><i>Observation Set.</i> Multiple observations for the same feature.</p> <p><i>Measuring device.</i> An instrument for determining the dimensions of a feature (as readings). Examples are total station, theodolite, transit, compass, and steel tape.</p>
Key Features and Functionality	<p>Once the <i>field survey setup file</i> is applied, the surveyor has available a prepared set of collection methods, forms, observation types and computations. The surveyor performs initial orientation to stage the instruments and obtain the basis of bearing. Tools are available to determine the next <i>feature</i> to be captured, and to assist in (1) the collection of the necessary component readings into <i>observation sets</i> based on the type of observation, and (2) the computation of those readings into <i>observations</i> and <i>measurements</i>. Observation sets can be input to and processed, evaluated, modified, and repeated until a satisfactory observation is derived.</p>

Application Integration	This set of operations is highly integrated with <i>SM-05 Perform COGO Layout</i> tools as computations always available to the surveyor. When working with measurement networks, tools such as <i>MM-01 Construct Measured Features</i> are also available. The <i>survey data set</i> and the <i>survey project</i> include the necessary information to conduct and complete the <i>field surveys</i> that are required.
Development Implications	In-field collection systems that lack a <i>computation device</i> will have limited computational capabilities.

8.6.2 SM-04 Collect Field Data Observations Overview

Use Case	SM-04 Collect Field Data Observations
Description	Actor performs field data collection by recording <i>readings</i> using a <i>data collection device</i> . Readings are <i>computed</i> with a <i>computation device</i> to derive <i>observations</i> and <i>measurements</i> .
Actors	Surveyor
Pre-Condition	<i>Data collection device</i> and <i>computation device</i> have been configured. Operator wants to capture and/or compute the relevant <i>readings</i> , <i>observations</i> , and/or <i>measurements</i> .
Post-Condition	<i>Readings</i> , <i>observations</i> , and/or <i>measurements</i> have been collected, computed, verified and stored.
Cross-Reference	<i>SM-03 In-Field Survey Setup</i> ; <i>SM-05 Perform COGO and Layout</i>

8.6.3 SM-04 Collect Field Data Observations Primary Scenario

Actor Action	System Response
1. This use case begins when the actor launches the process to collect and compute <i>readings</i> , <i>observations</i> , and/or <i>measurements</i> .	2. Open and display appropriate <i>observation collection forms</i> as defined in the <i>field survey setup file</i> .
3. Select and input to an <i>observation collection form</i> .	4. Populate <i>observation collection form</i> and subforms (e.g. metadata) as appropriate for the next <i>observation set</i> . (May be to reference station identifiers-new, occupied, backsight or foresight; may be RTK (Real-Time Kinematic) survey station information.) [new station] Setup station.
5. Operate the <i>measuring device</i> , obtain a <i>reading</i> and interact with <i>data collection device</i> (i.e., sight, measure and poll).	6. Capture <i>reading</i> , <i>observation</i> or <i>measurement</i> , add to current <i>observation set</i> . Provide tools for <i>computation</i> . Note: automated <i>readings</i> cannot be modified (Read-Only).

Actor Action	System Response
7. Select a <i>computation</i> to apply.	<p>8. Perform <i>computation</i>.</p> <p>Processes <i>observation set</i> as needed to derive <i>observations</i> and/or <i>measurements</i>.</p> <p>Display <i>observation set</i> and computed <i>measurements</i> as a map and as a report (of foresights, backsights and mean bearing, etc.).</p> <p>Provide choices to accept, reject or repeat current <i>observation set</i>.</p> <p>[<i>observation set</i> outside of defined tolerance] Notify/return to #3.</p> <p>[<i>observation set</i> in tolerance] Go to #9</p> <p>[<i>observation set</i> not complete] Return to #5</p> <p>[need to modify manually input observation data for <i>observation set</i>] Return to #3</p>
9. Choose to accept, reject or repeat current <i>observation set</i> , choose a new observation type, or choose to close session.	<p>10. Process action.</p> <p>[accept] Store <i>observation set</i> and <i>measurement</i>.</p> <p>[reject] Go to #3.</p> <p>[repeat] Go to #3.</p> <p>[new observation type] Go to #2.</p> <p>[close session] Exit with save options.</p>

8.6.4 SM-04 Collect Field Data Observations Secondary Scenarios

Name	Point of Occurrence/Overview
Actor needs to delete <i>observation set</i> .	Step #9. Delete <i>observation set</i> .
Actor needs to modify <i>observation collection form(s)</i>	Steps #3+. Return to #3.

8.7 SM-05 Perform COGO and Layout

8.7.1 SM-05 Perform COGO and Layout Analysis

Context	This is the toolbox that provides coordinate geometry (COGO) calculation methods and procedures. NILS actors may access COGO tools during a variety of operations. Surveyors perform computations in the field as they attempt to locate and calculate coordinates for physical features such as monuments, buildings, and watercourses. COGO computations are used during the construction of measured features within a measurement network. Parcel editors use these calculations and procedures to build legal description geometry and to edit the parcel fabric.
New Concepts	<p><i>COGO procedure.</i> A unique set of coordinate geometry (COGO) <i>computations</i> used to calculate coordinate positions. Example position calculation methods are <i>in-field coordinate geometry</i> (e.g., <i>bearing/bearing intersection</i>) and <i>layout by angle and distance</i>.</p> <p><i>COGO procedure parameter form.</i> A list of configuration options to assist the actor in the setup of <i>COGO procedures</i>.</p> <p><i>Point-ID duplication protection.</i> Prevents entry of an existing point identifier for any point already in the present data set into the COGO parameter form.</p> <p><i>Procedure duplication protection.</i> Prevents entry of an existing point procedure for any point already in the present data set into the COGO parameter form.</p>
Key Features and Functionality	The actor may choose from a variety of defined procedures and computation methods. Custom procedures can be defined by grouping and saving a set of standard computations. COGO procedures may be modified before and after processing to revise the input values and features, or to revise the calculation methods and steps used in the procedure. As geometric features are created, reference is maintained to the construction procedures that were employed to support data integrity (unique ID and method for each feature) and so that measurement-based features can be properly adjusted and re-constructed as needed.

Application Integration	COGO procedures as defined computations and calculations for the construction of measurement-based features must be available throughout the NILS application. If developed, <i>SM-05 Perform COGO and Layout</i> would be an application interface based on fundamental (lower-level) system functionality for building measurement-based features.
Development Implications	COGO procedures, calculations, computations and construction methods are essential tool components in the Field-to-Fabric common data model.

8.7.2 SM-05 Perform COGO and Layout Overview

Use Case	SM-05 Perform COGO and Layout
Description	Process to use coordinate geometry tools to calculate coordinate positions. Includes planar and geodetic calculations. May be used to perform layout or to search for point locations. May be used in conjunction with building a measurement network, a legal description fabric, or a parcel fabric.
Actors	Surveyor, Supervisor, Parcel Editor
Pre-Condition	Actor wants to calculate or layout the coordinates for point locations.
Post-Condition	New coordinates and their <i>computations</i> (calculation and COGO procedures) are saved.
Cross-Reference	<i>SM-04 Collect Field Data Observations; MM-01 Construct Measured Features; PM-03 Edit Legal Description Fabric; PM-05 Edit Parcel Fabric; MM-03 Edit Measurement Data; System Reconstruct Historical Version</i>

8.7.3 SM-05 Perform COGO and Layout Primary Scenario

Actor Action	System Response
1. The use case begins when actor selects <i>SM-05 Perform COGO and Layout</i> .	2. Display available position calculation methods (<i>COGO procedures</i> and other <i>computations</i>).
3. Choose <i>COGO procedure</i> type.	4. Present the appropriate <i>COGO procedure parameter form</i> . Assist actor to select features.
5. Select features (<i>points</i> , lines)	6. Update <i>COGO procedure parameter form</i> based on feature selection. Update display. Provide option for further input or run procedure. [no features selected] Go to #4. [features not correct / not complete] Go to #5.

Actor Action	System Response
7. Input to or modify <i>COGO procedure parameter form</i> . Run procedure.	8. Use selected features and <i>computation</i> parameters to generate point coordinates. Update <i>COGO procedure parameter form</i> with calculated coordinates or layout information. Update graphic display, including notification and symbolization of pre-existing points or IDs within distance tolerance. Prompt to save resulting coordinates and/or <i>computations</i> .
9. Respond to prompt.	10. Process according to input from actor. [save coordinates] save coordinates with appropriate point ID (may be new or replacement of existing) [save computations] save <i>computations</i> (to support audit; retrievable for layout, reconstruction). Prompt actor for (a) next <i>computation</i> of same type, (b) new <i>computation</i> type, or (c) quit?
11. Respond to prompt.	12. Process according to input from actor. [new] Go to #2. [next] Go to #4. [quit] End.

8.7.4 SM-05 Perform COGO and Layout Secondary Scenarios

Name	Point of Occurrence/Overview
Surveyor needs to establish a <i>field survey</i> before performing calculations.	Step #2/3. Use SM-02 Pre-Field Survey Setup or SM-03 In-Field Survey Setup to retrieve/apply <i>field survey setup file</i> and retrieve/setup <i>measurement data set</i> and reference data set.
Surveyor needs to establish an <i>observation set</i> to select input features or save output features.	Step #5/6. Use SM-04 Collect Field Data Observations and retrieve/setup <i>observation set</i> .
Actor needs to reconstruct a feature or duplicate a procedure from existing <i>COGO procedures</i> .	Step #3/4. Assist actor to find and retrieve feature and/or <i>COGO procedure</i> .
Actor needs to modify <i>computation</i> .	Step #7/8. Display <i>computation</i> in <i>COGO procedure parameter form</i> . Actor modifies values and system recalculates coordinate position.
New point violates <i>Point-ID duplication protection</i> .	Step #8. [point ID already exists] retrieve <i>computation</i> for existing <i>point</i> , display in <i>COGO procedure parameter form</i> . Actor modifies as needed. (Examples: (a) overwrite existing, (b) rename current or (c) cancel current, (d) mean, (e) append to point definition)
New point violates <i>procedure duplication protection</i> .	Step #10. [a <i>point</i> has previously been calculated with an equivalent <i>computation</i>] prompt actor to choose correct ID, delete duplicate ID.